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Framework for Developing Evaluation Strategies

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INTRODUCTION

In the fall of 2003, the U.S. EPA directed the states to develop an evaluation strategy for the Statewide Nonpoint Source Pollution Program. The state evaluation strategy is to measure the effectiveness of the nonpoint program at two levels: overall statewide program level and individual NPS projects or activity level.

A. The evaluation is to be used as a multi-purpose tool to:

1. Build on existing data collection of state NPS programs and their partners;
2. Select methods and approaches that are appropriate within each state;
3. Support accountability at program and project level; and
4. Provide mechanism to improve and strengthen the states' implementation approaches at the statewide and project levels.

The increased emphasis on environmental measures or outcomes will require the NPS Evaluation Framework to be closely integrated with the State's monitoring and assessment program. The Indiana NPS program monitoring is conducted by the sub-grantees and IDEM staff. IDEM's Assessment Branch data is requested by grantees for historical and supplemental data to be used in developing watershed management plans. The Assessment Branch data is the backbone for the 305(b) report and is also used to select streams added to the 303(d) list of impaired waters. Many of the 319 projects are selected in watersheds containing streams on the 303(d) list (an environmental indicator). Some projects are selected for education (a social indicator).

Historically, the greatest emphasis on measuring goals and final evaluations has been with administrative indicators, such as: funds spent, hours worked, and reports completed. This Evaluation Strategy will continue to use the administrative indicators, but with an increased emphasis on environmental and social indicators.

B. Timeline goals in this statewide NPS program Evaluation Strategy:

6/2005: Identify additional administrative and environmental indicators for assessing the effectiveness of the overall NPS Program.

Result 2005: Additional indicators were included in the evaluation framework.

Results 2006: Rough drafts of both social and environmental indicators have been provided to us by Purdue University through the Environmental Framework 319 project.

Results 2007: Rough draft of environmental indicators has been prepared by Purdue University. In addition to the final list of core social indicators, there is also an option to select additional social indicators that are selected on a project basis.

6/2005: Submit 319 grant application to develop environmental and social indicators for both baseline results and post-BMP results.
Results 2005: The first 2 years of the 319 grant is expected to begin by October 2005.

Results 2006: This project is on target to be renewed for the third and fourth year.

Results 2007: An additional year was added to the Purdue Environmental Outcomes I with the addition of gathering more detailed information with social indicators and to establish and environmental council. The Environmental Outcomes II 319 proposal was submitted for contracting. Still waiting for an executed contract.

10/2005 All NPS grant applicants will be required to supply information on project inputs, expected outputs, and short-term and long-term outcomes (or impacts) with their grant applications.

Results 2005: These elements were included in the 2005 grant applications and a much improved version was added to the 2006 grant applications.

Results 2006: These elements were also included in the 2007 grant applications and were part of the evaluation checklist.

Results 2007: These elements are included in the 2008 grant applications as part of the evaluation checklist.

10/2005 Develop a data storage system compatible with Storage and Retrieval (STORET).

Results 2005: A 319 grant was given to the IDEM Data Management Section to assist in this project with an emphasis on the Assessment Branch AIMS database. Another option to feed data through the Assessment Branch with 319 data in a acceptable format to be added to their AIMS database and the Water Quality Atlas. Other options are also being considered.

Results 2006: The RFP for the new AIMS II database is almost complete. The project manager worked with personnel from IT, the Assessment Branch, and NPS/TMDL to provide detailed information on the NPS database that will be housed with the original AIMS database. It will be separated by programs and data requirements. Also the database for the NPS data will have versatility not exhibited in the older AIMS. AIMS and AIMS II data will be downloaded to STORET (Water Quality Exchange [WQX]).

Results 2007: Proposals were solicited by the State and a contractor was selected. We are still waiting for the executed contract to begin.

6/2006: Identify social indicators for assessing the effectiveness of the overall NPS program.

Results 2005: Purdue will be awarded a 319 grant to complete this task.

Results 2006: The Purdue team, along with other Region 5 states, has developed a list of social indicators. They are in the process of developing a web-based tool box that will provide pre-project, middle project, and post-project surveys at the project level. They are also developing a database that will integrate with GRTS to house all the data collected from each 319 project.

Results 2007: The Purdue team is in the process of collecting baseline information using the developed indicators. Additional watershed projects are being selected for data collection and in-depth evaluation.

12/2006: Develop a long-term NPS monitoring plan to measure post-BMP results that will be updated annually.

Results 2005: Purdue University will be awarded a 319 grant to develop this plan.

Results 2006: The Environmental Framework project and the AIMS II project is addressing this issue and, with our assistance, will develop the appropriate monitoring plans. Also, we have begun to identify and work with a project by offering to supply equipment and additional funds in order to establish effectiveness monitoring with pre- and post-BMP implementation strategy and using a paired watershed to reduce the variability factor.

Results 2007: Implementation projects will submit strategy to measure the effectiveness of their BMP installations. Strategy will be provided with their proposals and added to their tasks list in the executed 319 grant.

12/2006 Incorporate environmental and social indicators into selected projects.

Results 2005: Purdue University will be awarded a 319 grant to complete this timeline goal.

Results 2006: Purdue, through the 319 grant, has already selected and collaborated with three projects throughout the State to complete this timeline.

Results 2007: Social Indicator data is already being gathered for the projects selected last year.

A clear plan for measuring the environmental indicators has not yet been finalized. Discussions for a few select projects selected for next year's budget may have increased sampling strategy before and during implementation designed to measure BMP effectiveness and changes in water quality.

12/2006: Develop a data storage system for additional indicators.

Result 2005: We redefined this timeline to, "Develop a procedure to store the results of the social indicators."

Results 2006: The AIMS II project has a draft RFP and will be ready to hire a programmer to develop this data storage system. The social indicators will be stored in a database that is presently being developed by the Region 5 states. This database will be integrated into GRTS.

Results 2007: The data storage system to collect social indicators has been developed by Region 5, but not yet released for use. The collection of environmental indicators has already begun with the individual 319 project. The Quality Assurance Project Plans require projects collecting environmental data to submit data to the project manager in electronic format, preferably in a Microsft Access table with required spatial and temporal information.

12/2006 Establish protocol for gathering baseline information for social indicators.

Results 2005: This timeline is expected to be included in the 319 Purdue University Environmental Framework project.

Results 2006: Purdue, with the 319 Environmental Framework project, is presently developing an online toolbox that will assist project coordinators in collecting baseline social indicators.

Results 2007: Toolbox has been developed, but is not officially online at this time. The first training to IDEM 319 and watershed specialist staff was presented by the Purdue team. The current contract was extended 1 year to add more in-depth study of social indicators and 319 projects. An additional 3 year contract, "Demonstration of Outcomes Phase II," was submitted for approval.

12/2007 Develop a system to accurately measure trends or environmental improvements, quantitatively, as a result of implementation of BMPs.

Results 2005: A basic system will be incorporated in each project's Quality Assurance Project Plans.

Results 2006: This system is being developed through the Purdue Environmental Framework project and also by incorporating the strategies used by a large project that were presented at the 2006 National Nonpoint Source Monitoring Conference.

Results 2007: Five projects were submitted to Region 5 EPA in the Accountability Project. Each year, the estimate load reductions are submitted to Region 5 EPA through the required database. Two of the projects have submitted first year results. The other three will be implementing BMPs next year. A "W" team has been assembled and will be selecting additional projects to evaluate changes to water quality. A proposal was submitted to the 319 project selection team to add additional monitoring capabilities for the purpose of showing improvements as a result of BMP installations. This may result in a decrease in the number of projects selected and an increase of budgets to the selected projects. Estimated number of projects to be selected are 3 to 4 total.

12/2007 Incorporate all indicators into selected 319 projects.

Results 2005: This timeline is expected to be completed on time.

Results 2006: Three projects throughout the State have already been selected and data is being gathered through a collaborative effort between project coordinators and Purdue University that is funded by the 319 Environmental Framework project.

Results 2007: Social Indicators have been incorporated into selected 319 projects and environmental indicators are being measured by several planning and implementation projects through environmental sample collection or models.

12/2008 Begin tallying the environmental quality improvements.

Results 2005: This timeline is expected to be completed on time.

Results 2006: Results from the three test projects will be summarized and the toolbox with training materials will be close to being launched.

Results 2007: Region 5 database systems for the collection and evaluation of effectiveness, using social indicators, have not yet been released. The database system to collect environmental indicators has found a contractor to complete the work but this project has not started and is awaiting an executed contract.

9/30/2009 Develop a formal report to provide feedback to the NPS program.

Results 2005: This timeline is expected to be completed on time.

Results 2006: This timeline is expected to be completed on time.

Results 2007: Report will depend on the establishment of a format to collect indicators and to measure their effectiveness. Updates in GRTS and the Social Indicator Toolbox, along with the NPS database with a means of uploading data into STORET (WQX), will provide results of the NPS program to Region 5 EPA.

GOALS AND STAFF

The Indiana Department of Environmental Management (IDEM) will develop one document that will describe an evaluation procedure for the overall statewide NPS program. The evaluation strategy must describe how the State will implement the evaluation activities for the NPS program and its relationship with the state monitoring and assessment programs. The State must be able to demonstrate this accomplishment as part of the annual NPS program report.

A. Goals of the Evaluation Framework are to

1. Develop indicators to improve performance-monitoring systems: administrative, environmental, and social
2. Develop logic models containing indicators that can be used to evaluate successes and failures of the 319 program and 319 projects
3. Develop specific, measurable, agreed-upon, realistic, and time-specific (SMART) objectives at the program and project level
4. Integrate monitoring results of the NPS program with the AIMS database in the Assessment Branch, or an acceptable alternative
5. Provide a mechanism for front-end, formative, and summative evaluations
6. Describe the strategy's adaptive management process by which evaluation results will "feedback" into the project and statewide
7. Integrate the goals of the evaluation framework into the 319 program by 2009
8. Identify a schedule, with milestones, for fully implementing the Evaluation Strategy

B. Nonpoint Source Programs and Staff Organization:

1. NPS Programs: The Federal Clean Water Act Section 319(h) provides funding for various types of projects that work to reduce nonpoint source water pollution. Funds may be used to conduct assessments, develop and implement TMDLs and watershed management plans, provide technical assistance, demonstrate new technology, and provide education and outreach. Organizations eligible for funding include nonprofit organizations, universities, and local, state, or federal government agencies. A 40% (non-federal) in-kind or cash match of the total grant cost must be provided.

2. Staff Organization of the Surface Water Nonpoint Source Program:

   a. Section Chief: This position manages the staff and work of the Watershed Management Section: This includes the State's Nonpoint Source Program, Sections 319, 104(b)3, and 205(j) Grant Programs, and watershed management issues.
   b. Program Administrator: This position is responsible for assisting with grant selection and program administration.
   c. Project Management Team Leader: This position oversees project management activities, drafting of contracts, reporting to EPA, and current operating procedures. This position also serves as a Project Manager.
   d. Special Projects Coordinator: This position works with projects such as the Indiana Water Quality Atlas, the Nonpoint sources Indicators Guide, and the

Conservation Tillage Initiative. This position provides technical support to the Watershed Management Section in the areas of GIS, BPS, database development/maintenance, and website design. This position also serves as a Project Manager.

e. Quality Assurance Manager: This position reviews and approves Quality Assurance Project Plans required of all projects conducting water quality or other technical monitoring. This position also serves as a Project Manager.
f. Project Manager: Project Managers assist grant recipients with their projects, ensuring that project tasks/duties, schedules, and budgets are implemented according to contractual requirements. Project Managers draft contracts, review quarterly and final reports, review watershed management plans, review financial claims, and conduct quarterly site visits.
g. Watershed Specialists: Water Specialists work with local groups and agencies to promote watershed management planning.
h. Operations Staff: Operations Staff works with sub-grantees to prepare and process contracts and provide financial tracking and interface with the U.S. EPA.

C. Assessment Branch Relationship with NPS program:

The Assessment Branch has conducted water, sediment, macro invertebrate, habitat, fish community, and fish tissue collection programs that will be used for nonpoint source projects. This data is stored in one database (AIMS) that can be queried by staff to supply NPS sub-grantees with historical data. In addition to the monitoring programs listed above, the Assessment Branch is also conducting TMDL sampling projects and special studies involving both fish community and water chemistry. After the full implementation of the Evaluation Strategy, the Assessment Branch will provide services for collecting follow up sampling for 319 projects on a limited number of watersheds.

In a meeting (8/2004) between the Watershed Management Section and the Assessment Branch, the following draft set of Water Quality Goals was established.

1. Encourage the use of monitoring data and localized information to identify nonpoint pollution sources.
2. Track changes in water quality due to NPS pollution on a statewide basis for aquatic life use support.
3. Establish a baseline for *E. coli* levels.
4. Promote restoration of watersheds impaired by NPS pollutants.
5. Focus resources on areas with approved TMDLs.
6. Establish a procedure to track restoration success for selected nonpoint source projects.

The long-term nonpoint source program will be included in the 5 year rotating basin monitoring schedule performed by the Assessment Branch staff. The TMDL 303(d) list investigations will be integrated into this 5 year rotating basin monitoring schedule.

In 2006, the Assessment Branch Biological Studies Section Staff (ABBSSS) selected a new 319 project that had several stream reaches on the 303(d) list for impaired biotic communities. The staff worked with the Salt Creek project coordinator and the 319 project manager to collaborate monitoring efforts. The ABBSSS collected fish community, habitat, and chemistry samples in several locations in the Salt Creek watershed. The project members collected additional samples with ABBSSS to complete their monitoring goals. This analysis is expected to identify critical areas and to establish a fish community baseline. A follow-up with the same sampling parameters is expected from ABBSSS after the implementation stage is complete. This is expected to result in a quantitative measurable improvement in the water quality in this project area.

In 2007, the work provided by the ABBSSS was halted. A new strategy has not yet been established. The Assessment Branch, USGS, and the NPS/TMDL section are working together with a 319 grant in establishing relationships between algal/chlorophyll, water chemistry, land use, habitat, macroinvertebrates, and fish communities, and to use these relationships for the purpose of establishing a state nutrient criteria.

NPS PROGRAM EVALUATION STRATEGY STRUCTURE

The Evaluation Structure will include indicators that will vary on the evaluation types, the desired outcomes, and the level/types of measurement required. Projects are solicited by the State with a desired set of administrative indicators and a variety of possible environmental indicators. NPS grant applicants complete the proposal format that requires information on project inputs, outputs, and both short-term and long-term outcomes or impacts. A standardized proposal evaluation is used to place the potential projects into categories and rank them by completeness and community support. The EPA then reviews and approves the final selection of projects to be funded. An initial meeting is held with the project sponsor to finalize project objectives, including a clarification of administrative, environmental, and social indicators included in their project. The formative evaluation, tracking activities, and expenditures will begin before the individual NPS projects starts and will be part of the planning and implementation processes. A state NPS project manager is assigned the responsibility to manage the individual projects. The state project managers will also be responsible for the outcome evaluations.

Effective NPS Program implementation of this Evaluation Strategy depends on collecting monitoring data of appropriate quality and quantity to establish baselines so that accomplishments and failures can be measured quantitatively. Timelines for development and implementation are listed in the introduction. However, presently limited monitoring data to establish baseline and post-implementation documentation can be collected from a number of sources such as, but not limited to, the following programs: the 305(b) and 303(d) Integrated Report, the Assessment Branch monitoring program, Biological Studies Section program, the TMDL program, and the 319 program. Assessing the effectiveness of the overall statewide NPS program will combine results from the project or watershed evaluations with broader evaluations of regional or statewide status. These results will include trends in water quality, aquatic biological conditions, target audience knowledge of NPS problems, and other environmental and social indicators. Presently, the assessment approaches include results from: ambient water chemistry monitoring, fish and macro invertebrate community surveys, fish tissue analysis, sediment chemistry sampling, habitat assessments, visual observations, photographs, watershed land use assessments, and social and behavioral information. Data generated from these monitoring activities may, when available, be used to assess watersheds and determine their baseline results and trends.

The State Evaluation Framework will include evaluation indicators, evaluation types, feedback loops and both internal and external communication of evaluation results.

A. Evaluation Indicators

NPS projects funded by the 319 grant program will include clear goals, quantitative objectives, and evaluation indicators to be measured. Three categories of evaluation indicators will be used to assess the effectiveness of Indiana's NPS program: administrative, environmental, and social. IDEM will track administrative indicators and selected projects will track environmental and social indicators.

Milestone: By 6/2005, submit 319 Grant Project to develop additional environmental indicators and social indicators for both baseline and post-BMP.

Results: Additional indicators were supplied in the 2005 report and in 2006 a draft list of both social and environmental indicators was established by Purdue.

Milestone: By 12/2005, the Watershed Management Section will identify minimum baseline parameters, DQOs, and analytical methods using a graded approach.

Results: *The NPS projects with monitoring elements have a basic list of parameters.*

In 2006, an additional approach was added. Each project's parameters will be selected on a goal and issue basis.

The NPS Monitoring Program will be updated annually.

1. Administrative Indicators are activities or products related to the execution of a program or project. NPS project managers evaluate proposals and manage projects. Indicators include all GRTS mandated elements and additional items such as funds spent and project tasks completed, which are also included in statewide project tracking systems.

Table 1: Possible Additional Indicators at Project and Program Levels

Administrative Indicators	Project Level Indicators	Program Level Indicators
Administrative Inputs Goals Proposals Staff Budget 303(d) list TMDL list Watershed Coordinators	Goals Issues Approved project Expenditures Time lines Invoices Implementation proposals	319 awards Projects completed Watersheds monitored Watershed management plans Implementation plans Total load reduction Critical areas identified BMPs implemented
Environmental inputs	Project Level Indicators Management practices Stressors of water quality Water quality conditions Social Indicators	Program Level Indicators Social Indicators
Laboratories Training Guidance Monitoring types Stakeholders Equipment Historical data Impaired parameters Samplers	Watershed groups Environmental goals Approved QAPP Geo-referencing data Quality environmental data Volunteer data Trained staff Critical area identification	Load reduction statewide Changes in stream miles impaired Delisting of streams on 303(d) list Sediment reduction Water quality standards
Outcomes		
Short-term	Medium term	Long-term
Source identification Baseline load reduction Critical areas identified BMPs installed Stream flashiness	Stream flow reduction Watershed Management Plan Sediment & Nutrient reduction Functioning BMP	@Water Quality Improvements @Stream use restored @Reduced 303 d list of impaired streams @Habitat repaired

Table 2. Possible Basic Set of Environment Indicators for Projects Requiring Sampling

Chemical Indicators	Biological Indicators	Physical Indicators
Phosphorus Nitrogen Solids/Turbidity Dissolved oxygen pH Chlorophyll a	Macroinvertebrates *E. coli* Fish Communities	QHEI Water temperature Stream flow BMPs

2. Environmental Indicators assess the effect of the NPS program or individual projects on the health of the environment. These indicators may be chemical, biological, or physical and will vary with individual projects. Indicators are dependent on the pollutant identified in each watershed. Data Quality Objectives (precision, accuracy, comparability, representativeness, completeness, and sensitivity) will be included with each project that requires sampling.

The results of Purdue's 2007 list is of environmental indicators presented in a draft report as follows:

Environmental Indicators to Document Success of Nonpoint Source Projects

DRAFT, Nov 17, 2006

Jane Frankenberger and other members of the Purdue Environmental Indicators Team (Lindsay Birt, Brent Ladd, Adam Baumgart-Getz, Ron Turco)

Overall Framework

We propose a system that includes hundreds of possible indicators, and allows nonpoint source projects to select those that are useful in documenting the success of their project. This may be a web-based list that would present all recommended indicators, grouped by impairment type. This system will be much more open-ended than the *social indicators* framework, in which a common set of indicators will be collected by most or all projects.

In this proposed environmental indicators framework, each project would be free to select a small subset of the available indicators, but would be asked to use a common measurement method for each indicator selected. If each project measures the indicators in the same way, the results can be aggregated to estimate statewide achievements.

Goals, Issues, and Outcomes

We suggest organizing the framework under general **goals** defined by water quality impairments. Since the overall nonpoint source framework is based on restoring impaired waters, structuring the overall organizing system by *impairments* (e.g., *E. coli*, nutrients, impaired biotic community, etc.) will fit most closely with how projects are generally planned and implemented.

Under each goal, several **issues** will be listed, each of which represents the major causes or sources of the impairments.

Under each issue, there will be a number of **outcomes** that nonpoint source projects strive to attain, and that the indicators are developed to represent. One or more **indicators** will be provided for each outcome**,** which can be used to determine the extent to which the outcome has been achieved. Each indicator will have one or more suggested methods of measurement. Because the environmental indicator selection has to be based partially on the feasibility of measurement, including measurement method from the beginning is vital. Using common indicators with common measurement methods will be important for aggregating project successes. Input will be widely sought on the proposed indicators and measurement methods.

The structure of the framework would therefore be the following:

1. **Goal** (Example: Reduce *E. coli* so that water is swimmable)
   1.1 Issue (Example: Failed septic systems)
   Outcome 1, Indicator, Measurement Method
   Outcome 2, Indicator, Measurement Method

Types of Indicators

We also propose including six different types of indicators in this framework, listed below and described in Table 1.

*Indicators of changes in **management** (M)*
- M1. Management is improved or appropriate BMPs are implemented.
- M2. Management improvements continue (for one or more years) and are effective; appropriate BMPs function well and are maintained

*Indicators of changes in loadings or **stressors** of water quality (S)*
- S1. Loading to streams is reduced – based on **load estimations**
- S2. Loading to streams is reduced – based on **water quality monitoring**

*Indicators of changes in water quality **condition** or uses (C)*
- C1. Water quality or habitat improves
- C2: Use is restored (fishing, swimming, drinking)

“M” indicators are the easiest to measure, but are further removed from the ultimate goal of improved water quality. “S” indicators may be measured by estimation techniques, or in limited cases by monitoring. “C” indicators are the highest level, but often very difficult and expensive to obtain.

Table 1: Description and Examples of Six Types of Indicators

Type	Definition	Examples	Typical measurement methods
M1	Management is improved or appropriate BMPs are implemented	• Percentage of people having their septic systems pumped • Number of livestock fenced out of streams • Percentage of construction sites using appropriate BMPs	These can often be measured using observational techniques, aerial or other photos, or surveys of target audience or others who are likely to have relevant information (e.g., Health Department). Some surveys done for other purposes (e.g., Tillage Survey) can be used.
M2	Management improvements continue and are effective; BMPs function well and are maintained	• Number of failed septic systems (a result after several years of pumping septic systems) • Livestock that are no longer in stream (a result of the fencing BMP above)	These indicators usually require a deeper level of observation to see whether the BMP or management change really had positive results.
S1	Loading to streams is reduced – based on load estimations	• Decrease in *E. coli* from failed septic systems • Decrease in sediment delivery from construction sites • Decrease in direct runoff from impervious areas	These indicators are estimated by applying a model or technique such as Spreadsheet Tool for Estimating Pollutant Loads (STEPL) to management changes or BMP-installed, such as those determined with the M1 or M2 indicators.
S2	Loading to streams is reduced – based on water quality monitoring	Similar to those listed above (S1), but different measurement methods: • Decrease in *E. coli* from livestock in stream (based on sampling upstream and downstream)	Upstream/downstream monitoring can be used for some stressors (e.g., straight pipe septics, livestock in streams, channelized runoff from construction sites). For others, paired watersheds or paired fields with separation barriers would be needed.
C1	Water quality or habitat improves	• Decrease in *E. coli*, nitrate, turbidity, etc. in stream • Decrease in stream flashiness • Improved aquatic community habitat	Paired watersheds are needed for statistically sound conclusions to be made about condition improvements.
C2	Use is restored (fishing, swimming, drinking)	• Improved aquatic community	

1. **Goal:** Reduce *E. Coli* so that water is swimmable
   1.1 Issue: Malfunctioning septic systems

Table 2: Example of Indicators (for one goal and two issues)

Outcome	Indicator	Type	Possible Measurement Methods
Percentage of septic systems properly maintained increases	Number of systems pumped per year	M1	Survey septic haulers and target homeowners
	Existence of maintenance institutions and number of participants	M1	Existence can be noted by project
Percentage of failed septic systems decrease	Number of failed systems	M2	Get number of failed systems each year from Health Department before and after project
E. coli loading from failed septic system decreases	*E. coli* loading from failed septic systems	S1	Use loading model to estimate load from number above
Straight pipe discharges are eliminated	Number of straight pipe discharges eliminated	M1	Identify them at beginning (the hard part), then at end; in general, the Health Department does not know about these, because they present no problem for the homeowner
E. coli loading from straight pipe discharges is eliminated	Estimated *E. coli* load from straight pipe discharges eliminated	S1 S2	Identify straight pipe discharges and use load estimation technique to calculate; monitor upstream/downstream of one, or the pipe itself (?)
E. coli in stream reduced	*E. coli* concentration (Level 5)	C1	Sampling; lab or volunteer methods. For scientifically valid monitoring, must be paired watersheds, upstream/downstream of changes, or have a very large change.
Water is swimmable	Beach closings Number of people swimming?	C2	Ask Health Department?

1.2 Issue: Livestock in stream

Outcome	Indicator	Type	Possible Measurement Methods
Fences and alternative watering systems in place	Number of systems installed	M1	Project or NRCS records; observation to learn any other changes
Livestock no longer in stream	Number of livestock previously in stream that are no longer	M2?	1. Estimate from fences installed (Project records, NRCS[c], observations) 2. Have quantifiable method of measuring cows in streams; photos from all bridges at regular intervals, etc.
E. coli loading from livestock in stream reduced	Estimated *E. coli* from livestock in streams	S1	Load estimation technique based on collected data; bacterial sampling[9]
	Monitored *E. coli*	S2	Water monitoring upstream and downstream of area before project, then again after[7];
E. coli in stream reduced	*E. coli* concentration (Level 5)	C1	Sampling; lab or volunteer methods. For scientifically valid monitoring, must be paired watersheds, upstream/downstream of changes, or have a very large change
Water is swimmable	Beach closings Number of people swimming?	C2	Ask Health Department?

Tentative List of Goals and Issues to Include

1. **Goal:** Reduce Pathogens (*E. Coli*)
   1.1 Issue: Malfunctioning septic systems
   1.2 Issue: Livestock in streams or pastures
   1.3 Issue: Confined livestock and Combined Animal Feeding Operations (CAFOs)
   1.4 Issue: Land application of manure
   1.5 Issue: Land application of wastewater
   1.6 Issue: Boat pumpout facilities
   1.7 Issue: Combined sewer overflows
   1.8 Issue: Wildlife

2. **Goal:** Reduce Sediment
   2.1 Issue: Cropland erosion
   2.2 Issue: Pastureland erosion
   2.3 Issue: Silviculture and timber harvesting
   2.4 Issue: Excessive streambank erosion
   2.5 Issue: Construction
   2.6 Issue: Urban runoff
   2.7 Issue: Stream channel modification

3. **Goal: Reduce Nutrients**
   3.1 Issue: Cropland (fertilizer application)
   3.2 Issue: Cropland (manure or wastewater)
   3.3 Issue: Landscaped spaces (lawns, golf courses); fertilizer application
   3.4 Issue: Construction erosion
   3.5 Issue: Urban runoff
   3.6 Issue: Combined Sewer Overflows (CSOs)
   3.7 Issue: Malfunctioning septic systems
   3.8 Issue: Pastures
   3.9 Issue: Boat pumpout

4. **Goal: Reduce Atrazine (or other pesticides)**
   4.1 Issue: Cropland application
   4.2 Issue: Lawn and golf courses

5. **Goal: Restore Stream Channel and Aquatic Communities**
   5.1 Issue: Impaired biotic communities
   5.2 Issue: Increased stream flashiness (could also be included under other issues).

Next Steps

1. Ask key people for overall comments on the usability and usefulness of the proposed framework.

2. Develop an initial list of indicators, based on a literature review including:
   - indicators that have been used in existing watershed plans;
   - indicators that are suggested in key watershed management guides; and
   - indicators developed at workshops and elsewhere to respond to commonly-desired outcomes of watershed projects.

3. Develop a web-based database framework for the initial list of indicators. This will allow it to be more easily accessed and reviewed. The database will include descriptions of measurement methods, a photo in some cases, and references to where the indicator has been used or described.

4. Ask a broader group of watershed managers and experts to review the proposed web-accessible list and provide input on the key characteristics of useful indicators. Workshops and/or a web-based survey may be included.

   The eventual result will be a web-accessible list of all indicators that have been found to be useful and are recommended for documenting the success of nonpoint source projects. New projects will benefit from seeing how others have documented their success in addressing the impairments faced by the new watershed group, and by not being required to develop their own from scratch.

5. Social Indicators assess the human behavioral effects of the NPS projects. Examples include general perception of environmental problems, awareness of NPS pollution sources and corrective measures, and participation level in NPS pollution control activities. Social Indicators assess the human behavioral dimension of individual NPS projects and the overall statewide NPS program. Social indicators can be collected before, during, and/or after an NPS project. Pre-project social indicators can be used to identify stakeholders, identify potential barriers to NPS BMP implementation, and develop information and education strategies.

Table 3: Social Indicators

To support the development of its evaluation framework for 319 funded projects, Purdue University is developing social indicators and supporting IDEM's development of environmental indicators for nonpoint source management. **Social indicators** in this context are used to measure the social components of nonpoint source projects, including measures of capacity, awareness, attitudes, and behaviors of target audiences. Many watershed groups implicitly try to build community and individual capacity, but have lacked the tools to measure the success of this work. Using social indicators as part of a package of assessment tools is a way to address these shortcomings and provide an immediate indication of how a project is proceeding. Purdue is working in conjunction with the other five land grant universities in EPA Region V to develop and test these social indicators. Pilot tests of the social indicators are currently being conducted in three watersheds: Clifty Creek, Eagle Creek, and the South Fork of the Kilmore Creek. Surveys to collect baseline social data are being sent to members of the target audiences in each of these watersheds. Purdue will then help these groups interpret the data and modify their interventions to more appropriately fit the social conditions in their watersheds. Purdue is also conducting capacity building with IDEM staff to develop a comprehensive understanding of how to collect, use, and interpret social indicator data.

Table 3: Examples of Input vs Output for Both Project and Program Social Indicator

	Project Social Indicators	Program Social Indicators
Input		
Stakeholders Evaluations Funding sources Watershed Coordinator	Observations Surveys Attendance Meetings Questionnaires Behavioral changes Public awareness	Number of watershed groups 319 Project selection Public awareness Knowledge Change in behavior
Output		
	Community meetings Public support Educational programs Leadership Newsletters Educational workshops Knowledge	Public involvement Public awareness Behavioral changes Success stories

	Critical behaviors Stakeholders identified Citizen awareness BMPs targeted Baseline information	
Social Outcomes	Project	Program
	Increased participation Stable education programs Change in behavior BMPs installed Capacity building Awareness and knowledge	Water quality improvement

Purdue and the Region 5 Social Indicator Team has developed a final list of core indicators to collect measurable changes within our 319 projects.

Table 4. Goals, Intended Outcomes, and Core Social Indicators

Goal:	Increased awareness among the target audience
Intended Outcome:	Awareness gained regarding the relevant technical issues and/or recommended practices of the target audience in the critical area
Indicator 1:	Awareness of pollutants impairing waterways
Indicator 2:	Awareness of consequences of pollutants to water quality
Indicator 3:	Awareness of appropriate practices to improve water quality
Goal:	Attitudes among target audience supportive of NPS management actions
Intended Outcome:	Attitudes changed in a way that is expected to facilitate desired behavior change of target audience in the critical area
Indicator 1:	General water quality related attitudes
Indicator 2:	Willingness to take action to improve water quality
Goal:	Reduced constraints for using appropriate practices
Intended Outcome:	Constraints to behavior change will be reduced
Indicator 1:	Constraints to behavior change
Goal:	Increased capacity to address NPS management issues in the project area
Intended Outcome 1:	The project improved the recipient's capacity to leverage resources in the watershed
Indicator 1:	Resources leveraged by grant recipient in the watershed as a result of project funding (including cash and in-kind resources)
Intended Outcome 2:	Increased capacity to support appropriate practices by target audience in critical areas
Indicator 1:	Funding available to support NPS practices in critical areas
Indicator 2:	Technical support available for NPS practices in critical areas

	Indicator 3:	Ability to monitor practices in critical areas
Goal:	Increased adoption of NPS management practices by the target audience	
	Intended Outcome:	Project resulted in changes in behavior and/or adoption of practices to prevent new problems and improve or maintain water quality in the critical area by the target audience
	Indicator 1:	Percentage of critical area receiving treatment
	Indicator 2:	Percentage of target audience implementing practices in critical areas
	Indicator 3:	Ordinances in place that will reduce nonpoint source stressors

6. Baseline Indicator Data: Some baseline environmental indicator data has been and will continue to be collected through the 5 year rotating basin statewide monitoring program and other sources. Baseline Social Indicator data may be collected for individual projects assessing the attitudes and/or behaviors of special target audiences.

Table 5: Possible Baseline Environmental and Social Indicators

Environmental Indicators	Social Indicators
Stream flow	Farming practices
Water quality standards	Land use
Nutrient and sediment loading	Public knowledge
River miles impaired or threatened by NPS pollution	Recycled materials
	319 proposals
Biological index	Watershed groups
QHEI	Stakeholders
Temperature	Volunteers
Unimpaired areas protected	BMPs

B. Evaluation Types

Effective evaluations will take place at different times during the process. Four evaluation types will be utilized to assess the effectiveness of Indiana's NPS Program.

1. Formative Process Evaluation includes proposal reviews and selection, time-lines, quality assurance project plans, site visits, and quarterly reports necessary to execute an adaptive management approach to keep a project or program on track and headed in the right direction. Most NPS projects are conducted over a short period of time of 1 to 3 years and will focus on administrative indicators of progress. Project-specific process evaluations will be conducted at regular intervals, quarterly updates, site visits, project expense invoices, budgets, and quarterly milestones identified in the project work plan.

2. Outcome Evaluation includes project closure, implementation plan, and final report that will focus on determining the extent of the NPS project achievement of its short-term goals and objectives. Outcome evaluations are conducted upon the completion of specific NPS projects and will utilize environmental, social, and administrative indicators as appropriate, and collected results will be documented

in a project's final report. There will be two levels of outcome evaluation for specific NPS projects: evaluation using just administrative indicators or some other indirect assessment of environmental and/or social impacts, or more complicated, quantitative evaluations using environmental and/or social indicators.

3. Impact Evaluation (3-5 years) focuses on assessing the long-term effectiveness of the program and its projects and will require information on all three indicator types: administrative, environmental, and social. The timeframe appropriate for post-implementation impact evaluation will depend on the expected response interval. The response due to a NPS Project are as follows: for water chemistry in most cases would be around a year, biological response would be several years, and stream channel improvements could take decades. Impact Evaluations will be used on a subset of the total NPS projects and activities, and projects selected must have sufficient baseline data to assess the environmental changes. The final report may contain impact evaluations that are estimated values calculated and presented in the final Watershed Management Plan submitted at the end of the project.

COMMUNICATION OF NPS RESULTS INTERNAL AND EXTERNAL

A. Internal communication of NPS program evaluation results is currently achieved by the following mechanisms:

1. Administrative Indicator information is compiled in the Grants Reporting and Tracking System (GRTS) database. The GRTS is accessible to NPS program staff and contains basic information such as project location, organizational details, and quarterly reports.
2. Environmental Indicator data from NPS-related field studies is expected to be uploaded into STORET (WQX) by IDEM's OWQ Data Management Section or Assessment Branch in the future. Presently, the data is collected and stored electronically on a disc and also, in most cases, is displayed on the sub-grantee's website.
3. Assessment Branch environmental data is available upon request to IDEM Assessment Branch staff and through the Indiana Water Quality Atlas.
4. Other program areas are notified and sent a copy of final report and information for projects that may be of interest to them, if requested.

Milestone: Improved external communication of the NPS data by collecting and uploading data to STORET is expected to be started by 12/2006.

Results 11/2006: The Relative Percent Difference (RPD) to solicit a programmer to accomplish this milestone is in the signature process and will soon be submitted.

Results 11/2007: A programmer was selected and the contract is awaiting execution.

Milestone: Improve internal communication of the NPS Program by including NPS data from grantees to the Assessment Branch system, AIMS, by 12/2006.

Results 11/2006: The NPS data will go into AIMS II database and will be housed with AIMS data but, will be separated by program areas.

B. External Communication of NPS Program Evaluation Results:

1. FFY Annual Indiana Nonpoint Source Pollution Management Program report
2. 305(d)/303(d) integrated report
3. IDEM's Office of Water Quality website
4. Indiana Water Quality Atlas (already available on the IDEM website). A description of this project is discussed next and on the IDEM OWQ website.

COMMUNICATION OF NPS RESULTS INTERNAL AND EXTERNAL

Improving the effectiveness of Indiana's NPS Program requires a "feedback" process.

Table 6: Feed Back Loop for the NPS Projects and Program Included in Evaluation

Evaluation Types	Feedback
Formative	Initial site visit Site visits Quarterly reports Quality assurance project plan
Outcome	Final report Quality data GRTS NPS annual report Quality benefit Behavioral changes Estimate changes in the environment
Impact	Water quality improvement

Milestone: A formal report to provide feedback from the fully implemented Evaluation Strategy into the NPS program by 9/30/2009.

Milestone: A way to document and communicate internal and external lessons learned by 9/30/2009.

The State will document progress in implementing the Evaluation Strategy periodically. The Strategy will be revised as needed (minimum of annually) to include updated development and implementation components progressing toward full implementation of the Evaluation Strategy by September 30, 2009.